ANR-0150

Corn Response to Long-Term Weather Stressors

ANR-0150-Table 1 Summary of long-term weather stresses, potential management decisions, and challenges associated with their implementation (Ortez et al., 2023).

Long-term Stress Source	Management Decision	Challenge with Implementation
Drought and High Temperatures	Minimize the occurrence of stress during the kernel set period to optimize plant growth rate and ensure kernel numbers are preserved through varying hybrid-relative maturities or planting date variations.	It is unclear when stress occurrence will appear within a season, and the critical period is long (one week before to three weeks after silking).
	Drought-tolerant hybrids can produce a 15–45 bushels-per-acre (bu ac–1) yield increase relative to drought-sensitive hybrids if drought conditions exist. On the other hand, drought-tolerant hybrids can have 5–15 bu ac–1 lower yield relative to the standard hybrids when hybrids are grown under adequate moisture conditions.	Higher yields for drought-tolerant hybrids have not been consistent or have been negative at times. Yield advantage of drought-tolerant inconsistencies have been partly attributed to different yield levels or actual water availability.
	Conservation tillage has been largely recommended for goals related to soil conservation, water management, and building soil organic matter, which are all critical aspects of crop production.	Yield advantages have been reported in no-till systems (relative to conventional tillage) in southern areas of the United States. Lower yields have been reported in no-till systems in the northern United States (due to colder and wetter spring conditions and poorly drained soils).
	Use of controlled drainage structures may help retain water to facilitate off-season soil moisture recharge and could possibly raise the water table to help alleviate short-term water deficit conditions.	Cost of installation is high, and the benefit may not be realized every year. Its suitability will be location specific.

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Long-term Stress Source	Management Decision	Challenge with Implementation
Solar Radiation	Increase conservation tillage practices to reduce soil erosion and conditions suitable for dust storms, which can cause short periods of light occlusion.	Tillage or field activities that generate dust may be necessary for other agronomic purposes (e.g., alleviate compaction, basic field operations).
	Consider leveraging daylength to maintain or improve grain yield under reduced intensity conditions by planting earlier in the season.	Cold and wet conditions may not be suitable to leverage early planting.
	Hybrid tolerance to reduced solar radiation varies, and frequency of events reducing solar radiation (e.g., wildfires) have increased.	Unclear tolerance levels in modern hybrids. More research on this is needed as conditions that alter solar radiation interception are likely to increase in frequency and severity.
	Adjust plant densities or plant arrangements (e.g., row spacing, solar corridors) to facilitate greater light penetration into crop canopies.	Changes in plant density need to be applied prior to stress occurrence and may be less than optimum under adequate light. It is difficult to predict how solar radiation will be impacted in each year/region. Solar corridors may differentially benefit crop types or hybrids.
Differences in Heat Unit Accumulation Throughout the Season	Adjust relative maturities to leverage longer seasons (e.g., earlier last-freeze dates in spring, later first-freeze dates in fall) or pursue other rotational practices (e.g., double-cropping, alternative crops).	Wet and/or cold weather may prevent leveraging of the full season. Photothermal quotient influences rate of phenological development and yield potential. Inconsistencies in relative maturity ratings exist. Finding viable markets may affect rotational crop expansion.
	Anticipate that soil management practices can affect the speed of early-season development through about the V6 stage. Air temperature is the main driver of phenology after V6 stage.	Soil or water conservation practices may impact corn growth rates early. Soil drying and warming may further be delayed by residue retention resulting in later plantings that could warrant relative maturity adjustments.
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Differences in Heat Unit Accumulation Throughout the Season	Adjust relative maturities to account for the planting date, though a shift in maturity may be affected by growing degree day compression or elongation during vegetative stages and grain filling.	Could affect the accuracy of stated growing degree day requirements to flowering and/or maturity. May limit the grain filling period and affect dry-down period and late-season disease pressure.
	Validate digital platform estimates of crop phenology with scouting and field checks. Different tools that supply phenological predictions are available from multiple sources (e.g., universities, industry).	Phenological modeling can help, but improvements need to be made to ensure that the management strategies used are effective and proactive. Understand the limitations of when tools are applicable, and scout to verify that predicted stages have been achieved.